

WHAT IS CLAIMED IS:

1. A gas-selective permeable membrane comprising:
a body (11) of a material permeable to at least one selected test gas and substantially impermeable to at least another gas, said body (11) comprises at least one reduced thickness area (15) highly permeable to said test gas, said reduced thickness area (15) being at least partly surrounded by a thicker area (16) ensuring the structural strength of the membrane.
2. The gas-selective permeable membrane of claim 1, comprising a plurality of said reduced thickness areas (15), said reduced thickness areas (15) being completely surrounded by a plurality of thicker areas (16).
3. The gas-selective permeable membrane of claim 2, wherein said thicker areas (16) are substantially impermeable to said at least one selected test gas.
4. The gas-selective permeable membrane of claim 3, wherein said reduced thickness areas (15) have a circular shape.
5. The gas-selective permeable membrane of claim 4, wherein said body (11) is shaped as a planar disc.
6. The gas-selective permeable membrane of claim 5, wherein said reduced thickness areas (15) are distributed on a same face of said disc.
7. The gas-selective permeable membrane of claim 6, wherein said reduced thickness areas (15) are randomly distributed.
8. The gas-selective permeable membrane of claim 7, wherein said reduced thickness areas (15) are formed by corresponding dead cavities (13) with conical and outward-flaring longitudinal cross-section.
9. The gas-selective permeable membrane of claim 1, further comprising heating means (17) for heating said at least one reduced thickness area (15).
10. The gas-selective permeable membrane of claim 9, wherein said heating means (17) comprises an electrical resistor partly covering said reduced thickness area (15).

11. The gas-selective permeable membrane of claim 10, wherein said reduced thickness areas (15) have substantially circular shape, and wherein said electrical resistor extends along at least part of a circumference of which the diameter is between the diameter of said reduced thickness areas (15) and a centre thereof.
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12. The gas-selective permeable membrane of claim 11, wherein said electrical resistor (17) comprises a film (17a) of a conductive material bonded to said body through an adhesive layer (17b), said conductive film being coated with a protecting layer (17c).
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13. The gas-selective permeable membrane of claim 12, wherein said film (17a) is made of a material selected from the group consisting of chromium, copper and aluminium,
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14. The gas-selective permeable membrane of claim 12, wherein said adhesive layer (17b) is made of titanium.
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15. The gas-selective permeable membrane of claim 12, wherein said protecting layer (17c) is made of gold.
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16. The gas-selective permeable membrane of claim 1, wherein said body is made of quartz or glass with high silica content, and wherein said at least one selected gas is helium.
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17. The gas-selective permeable membrane of claim 16, wherein said body is a sheet having a thickness in a range of 800 to 900 μm , and wherein said reduced thickness areas (15) are about 10 μm thick.
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18. An apparatus for gas leak detection, comprising:
a vacuum-tight chamber;
a vacuum pump connected to said chamber to bring the pressure in said chamber to a
30 lower value than in an outside environment;
a gas-selective permeable membrane separating at least a portion of said chamber from the outside environment, said membrane comprising:
a body of a material permeable to at least one selected test gas and substantially
35 impermeable to at least another gas, said body comprising at least one reduced thickness area
highly permeable to said test gas, said reduced thickness area being at least partly surrounded by

a thicker area; and

heating means for heating said at least one reduced thickness area with an electrical resistor partly covering said reduced thickness area, and

means for detecting a presence of said at least one selected test gas in said chamber.

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19. The apparatus for gas leak detection of claim 18, wherein said body of said gas-selective permeable membrane is a planar disk with a plurality of said reduced thickness areas having circular shapers being completely surrounded by a plurality of said thicker areas that are substantially impermeable to said at least one selected test gas.

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20. A method of manufacturing a gas-selective permeable membrane, comprising the steps of:

providing a body (11) of a material permeable to at least one determined test gas and substantially impermeable to at least another gas;

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forming at least one reduced thickness area (15) permeable to said at least one gas on said body (11), and

removing a material from said body so as said at least one reduced thickness area (15) being at least partly surrounded by a thicker area (16) ensuring the structural strength of the membrane.

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21. The method of claim 20, wherein said body is a planar sheet (51) and wherein said step of removing the material from said planar sheet further comprising:

coating a face of said planar sheet (51) with a layer of amorphous silicon (53);

coating said layer of amorphous silicon with a layer (55) of a photosensitive material;

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covering said photosensitive layer (55) with a lithographic mask (57) having a plurality of openings (59);

submitting said face to ultra-violet ray irradiation;

removing said lithographic mask (57) and submitting said face to a dry etching process by a plasma treatment;

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removing said layer (55) of photosensitive material and submitting said face to an ultrasonic drilling process; and

submitting said face to a wet etching process in a bath of an acid solution, and removing said amorphous silicon layer (53).

35 22. The method of claim 21, wherein said bath is an aqueous HF solution.

23. The method of claim 21, further comprising the step of applying a film of conductive material forming an electrical resistor (17), onto said planar sheet (51), by gluing or deposition.